MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

DET5058 – DIGITAL ELECTRONICS

(All Groups)

12 OCTOBER 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTION TO STUDENT

1. This question paper consist of **6** pages (**5** pages for questions and **1** page for appendix).
2. Answer **ALL** question.
3. Please write all your answers in the answer booklet provided.

QUESTION 1 [25 MARKS]

a) Explain **analog representation** and **digital representation** as the ways to represent the numerical values of quantities.

[2 marks]

b) State **two** disadvantages of digital systems.

[2 marks]

c) Convert the following numbers.

i. 1387_{10} to binary

[2 marks]

ii. 547_8 to hexadecimal

[2 marks]

iii. $703D_{16}$ to octal

[2 marks]

d) Solve the following signed number calculation in the 2's complement form.

i. $10001100_2 \times 00111001_2$

[5 marks]

ii. $25_{10} \div -5_{10}$

[5 marks]

iii. $23_{16} + (-1A)_{16}$

[5 mark]

Continued...

QUESTION 2 [25 MARKS]

a) State the Boolean expression for output X for each circuit in Figure 1.

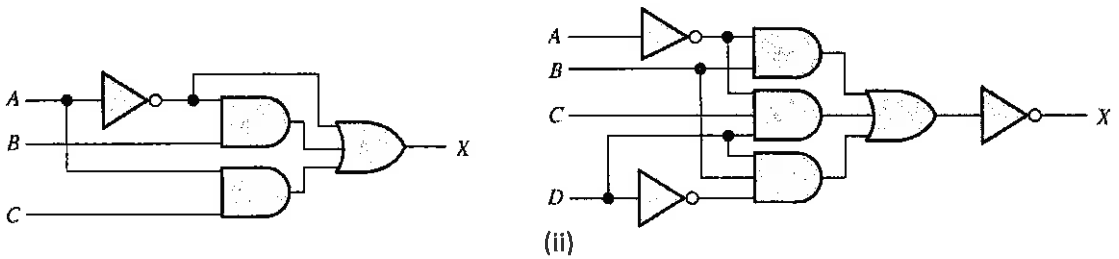

Figure 1

[4 marks]

b) Given $\overline{A \oplus B + B} + AC + (A + D)$.

i. Draw the logic circuits.

[5 marks]

ii. Complete the truth table in Table 1 below.

[8 marks]

A	B	C	D	$\overline{A \oplus B + B}$	AC	$(A + D)$	OUTPUT
0	0	1	0				
0	1	0	1				
				(2 m x2)	(1m x2)	(1m x2)	(1m x2)

Table 1

c) Simplify the following Boolean expressions using Boolean simplification, then draw the circuit of simplified expression:

i. $(A + C)(AD + A\overline{D}) + AC + C$

[4 marks]

ii. $\overline{A}\overline{B}\overline{C} + \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}C + ABC$

[4 marks]

Continued...

QUESTION 3 [25 MARKS]

a) Draw the logic circuit for $AB+C$ using NAND gate only.

[4 marks]

b) Given $\overline{ABC} + AB + \bar{A}BC$:

i. Find the standard SOP.

[2 marks]

ii. Draw the truth table from this standard SOP.

[2 marks]

iii. Write the equivalent POS.

[2 marks]

iv. Draw the Karnaugh map for the expression.

[3 marks]

v. Find the minimum SOP.

[3 marks]

c) Given truth table as Table 2. Find the minimum SOP using K-Map.

[9 marks]

A	B	C	D	OUTPUT
0	0	0	0	0
0	0	0	1	1
0	0	1	0	X
0	0	1	1	1
0	1	0	0	0
0	1	0	1	X
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

Table 2

Continued...

QUESTION 4 [25 MARKS]

a. Define decoder.

[2 marks]

b. Design a decoder that can decode input 1111 into LOW output with limitation using only **a unit** of NOT gate and **a unit** of AND gate.

[5 marks]

c. How to make the design in question 4(b) produce HIGH input if you are only allowed to change one gate only?

[2 marks]

d. Construct the truth table for 4 data input multiplexer with 2 data selector.

[4 marks]

e. Draw the logic circuit for half-adder with 2 inputs. Given to you the half adder truth table as in Table 3

A	B	C_{OUT}	$\sum$
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Table 3

[5 marks]

f. Determine the sum and output carry for a full-adder with $C_{in} = 0$, $A = 1$ and $B = 0$.

[3 marks]

g. Complete the truth table for active-High S-R latch.

[2 marks]

S	R	Q	$\overline{Q}$
0	0	i.	NC
0	1	ii.	iii.
1	0	1	0
1	1	iv.	1

Table 4

h. State one of the applications of flip-flops.

[2 marks]

End of Page.

APPENDIX: RULES OF BOOLEAN ALGEBRA

1. $A + 0 = A$
2. $A + 1 = 1$
3. $A \cdot 0 = 0$
4. $A \cdot 1 = A$
5. $A + A = A$
6. $A + \overline{A} = 1$
7. $A \cdot A = A$
8. $A \cdot \overline{A} = 0$
9. $\overline{\overline{A}} = A$
10. $A + AB = A$
11. $A + \overline{A}B = A + B$
12. $(A + B)(A + C) = A + BC$